NETWORK AND MISSION SERVICES PROGRAMS

Demand Access System
Operations Concept Document

Original

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National Aeronautics and
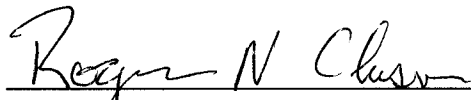Space Administration

Goddard Space Flight Center
Greenbelt, Maryland

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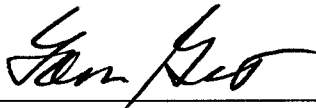
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Preface

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FIGURES

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Section 1 Introduction

1.1 Purpose

The purpose of the Demand Access System (DAS) is to allow expansion of the Tracking and Data Relay Satellite System (TDRSS) Multiple Access Return (MAR) capabilities. The DAS will build on the Third Generation Multiple Access Beamformer subsystem (TGBFS) development by adding demodulation functions, global system control and data distribution capabilities.

1.2 Background

The existing Tracking and Data Relay Satellites (TDRSs) provide pre-scheduled communication services to customers by using ground-based electronics to process signals emanating from customer emitters that are relayed by the TDRS MA on-board phased array antenna systems. The TGBFS allows expansion of services by using Element Multiplexer Correlators (EMCs). The TGBFS EMCs allow COTS Independent Beamforming Units (IBUs) to be connected to each unit. The beamformers are then, in turn, connected to demodulators.

The use of the existing TGBFS equipment, the addition of IBUs and the addition of demodulators and system control functions will position the SN to better meet emerging customer needs.

1.3 Reference Documents

Document Number	Document Title
450-SNUG	Space Network Users Guide
530-RSD-WSC	Requirements Specifications Document for the White Sands Complex
451-OCD-TGBFS	Operations Concept Document for the Third Generation Beamforming System
453-ICD-DAS/SWSI	The Interface Control Document between the Demand Access System and the Space Network Web Services Interface

453-ICD-DAS/Customer	The Interface Control Document between the Demand Access System and the DAS Customers
453-ICD-DAS/WSC	The Interface Control Document between the Demand Access System and the White Sands Interface
530-WSC-0024	Information Technology Systems Security Plan (ITSSP) for the WSC
530-WSC-0009	WSC Security Manual
452-SP-SWSI	Security Plan for SWSI
290-003	IP Operational Network (IOnet) Security Plan
290-004	IP Operational Network (IOnet) Access Protection Policy and Requirements Document
NPG 2810.1	Security of Information Technology for Mission Information

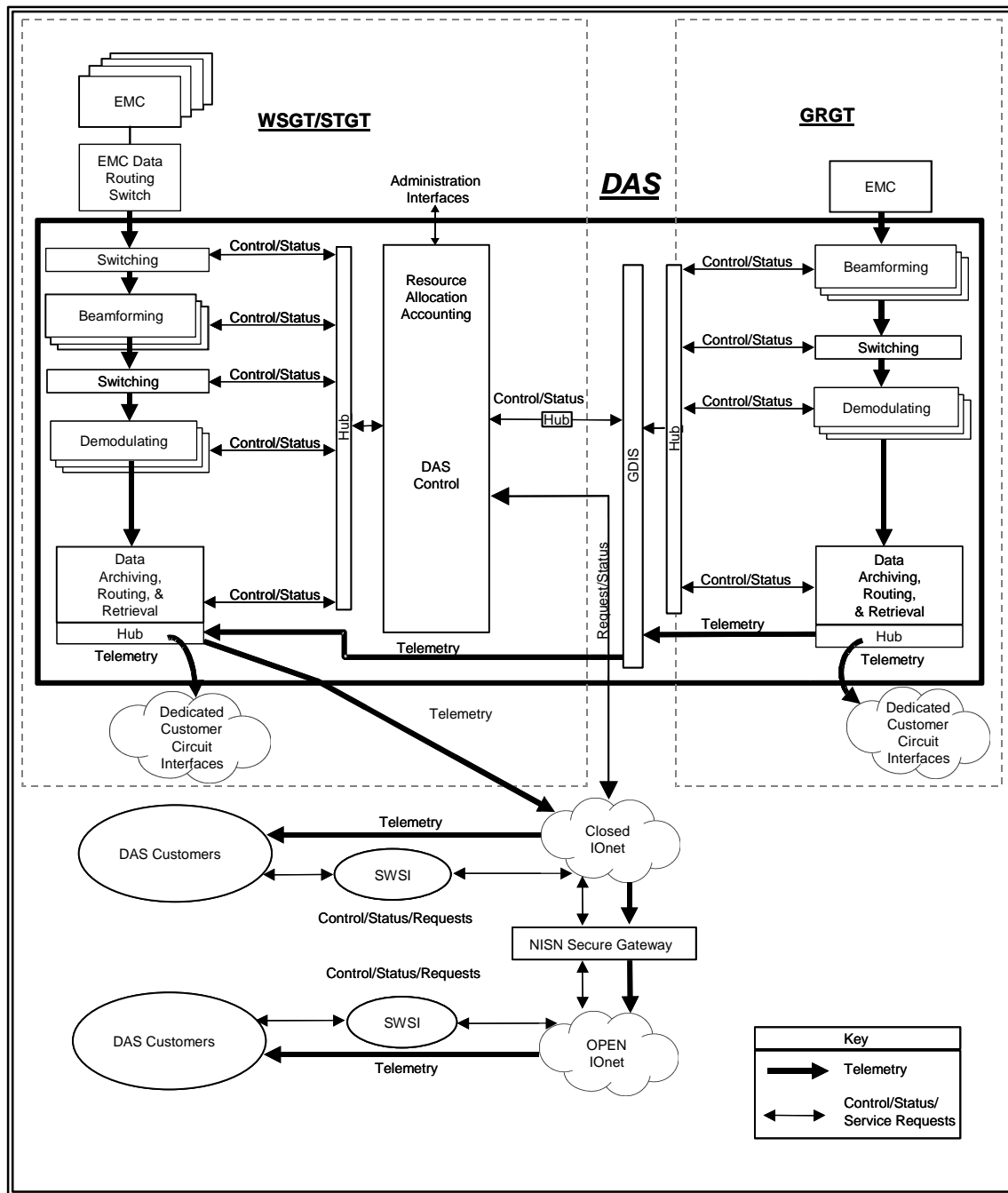# Section 2.   System Description

2.1   System Objectives and Purpose

The objectives of DAS are:

a. Provide a capability to support continuous or intermittent, conflict-free, DAS MA return link services 24 hours per day, 7 days per week upon demand from customers.

b. Provide an automated capability to transition DAS customer services between TDRSs/SGLTs.

c. Provide a capability to support multiple, DAS MA return links per TDRS/SGLT/Ground Station.

d. Meet or exceed current communications performance and capabilities of the existing MA return link with the exception of the functions not possible due to the lack of tie-ins with the MA forward link (such as coherent turnaround support, cross support, two-way ranging, range zero set, etc.)

e. Provide beamforming, demodulating, data distributing and short-term storage capabilities for each DAS service.

f. Automate the operation of all DAS return link resources.

g. Provide resource allocation accounting.

h. Provide COTS data and control interfaces for DAS customers with the flexibility of accommodating non-standard/customer-unique telemetry interfaces (e.g. use of dedicated T1s and/or fiber).

i. Provide simple, low cost, modular beamforming, demodulating, routing and storage expansion functions, which can be modularly expanded to add DAS return link channels as needs change.

j. Provide customers with the capability of obtaining dedicated DAS services.

2.2 Functional Description

Figure 2-1 depicts the high level DAS elements and interfaces that support DAS services:

Figure 2-1 DAS Functional Elements and Interface

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2.2.1 Customer Interaction

The DAS will communicate information to and from the customer via the Space Network (SN) Web Services Interface (SWSI). The SWSI interface to DAS allows the customer insight into available resources, allows the customer to submit requests for DAS services, and permits monitoring of DAS service performance.

2.2.2 DAS Control

The DAS will automatically provide customers with requested services by managing the operations of DAS resources.   The DAS will provide alert information to the operations personnel and service status data to the customer and operations personnel. The DAS will maintain and report resource allocation accounting and quality of service.

2.2.3 Beamforming

The beamforming element will form beams by processing signals from the existing Element Multiplexer Correlators and will provide the formed beams to the demodulating element. The Beamforming interfaces will allow one-to-one and one-to-many connection with the demodulating element.

2.2.4 Demodulating

TGBFS demodulation will despread and demodulate customer signals using the beams provided by the beamforming element.   All signal formats and data channel configurations, which are valid for Space Network non-coherent, multiple access S-band return services will be supported by the Demodulation element, e.g., Data Group 1, Mode2. The demodulation element will process doppler, coherently combine I and Q data channels when single data source/dual channel/balanced power data channel configurations are present, and incorporate the expanded user frequency uncertainty acquisition frequency range for acquisition of customer signals.

The Demodulation element will meet or exceed the current communications performance and capabilities of the existing MA return link with the exception of the functions not possible due to the lack of access to an MA forward link.

2.2.5 Data Archiving, Routing and Retrieval

Customer baseband data will be sent to an archiving element for retention and future retrieval and/or sent to an appropriate routing element for distribution to the customer.

2.3   Assumptions

The DAS will be operated as a part of the Space Network (SN). It is assumed that the Space Network will continue to operate throughout the life of the DAS. The DAS is not capable of operations with the second-generation satellites (TDRS–HIJ).

Section 3.   External System Interfaces and Supporting Elements

3.1 Interfaces

The DAS will interface with the following elements:

a. WSC system
b. WSC Operations and Maintenance personnel through a Local Control and Monitor
c. Customer Mission Operations Center via SWSI for Control and Status and via NISN for Telemetry

3.2   Supporting Elements

DAS is supported by the following elements of the Space Network

a. First-generation TDRSs (F1 through F7)
b. EMC equipped Space Ground Link Terminals (SGLTs) at WSGT/STGT and GRGT
c. Facility infrastructures at WSGT/STGT and GRGT

Section 4.   System Operational Characteristics

4.1   DAS Customer Interaction

The DAS will interact with the customer by:

    a. receiving the following information from the customer via SWSI:
        1. Resource Requests
            a. Customer location and identification
            b. TDRS ID
            c. Type of Service
            d. Period of Service
            e. Signal Characteristic (to set up demodulation and other DAS components)
            f.   Archive Requests
            g.   Data routing
        2. Emitter ephemeris data
            a.   Emitter type
            b.   Epoch Time
            c.   Emitter Position (X, Y, Z at epoch in meters)
            d.   Emitter Velocity (X, Y, Z at epoch in millimeters/second)
            e.   Mass of Satellite
            f.   Average Cross-sectional Area of Satellite
            g.   Drag Coefficient
            h.   Solar Reflectivity Coefficient
        3. Reconfiguration Request
        4. Reacquisition Requests
        5. Status Requests

    b. providing the following information to the customer via SWSI:
        1. Acknowledgement and status of requests
        2. Resource allocation assignments
        3. Resource availability
        4. Real-time service status and performance

4.2   DAS Control

Control of the DAS will have the following characteristics:

    a.   Interacting with the DAS customer via SWSI
- Receiving, acknowledging and replying to customer request
- Requesting and processing ephemeris data from the customer
- Relaying status to DAS customers

    b.   Interfacing with DAS elements
- Commanding DAS functional elements to configure for customer requests
- Receiving status from DAS functional elements

c. Interfacing with the WSC system
- Resource allocation accounting
- Interfacing with the WSC CTFS/Timing Interface
- Interfacing with the WSC Sub-System Controllers (SSC)
- Requesting TDRS ephemeris data
- Interfacing with WSC Operations and Maintenance personnel

4.3   Beamforming

DAS Beamforming will have the following characteristics:
a. Interfaces with the DAS Control
b. Receiving and acknowledging configuration commands
c. Receiving ephemeris data
d. Receiving MA element signals from the Element Multiplexer Correlator interface
e. Forming beams
f. Transmitting formed beams for demodulation
g. Deleted
h. Providing status to the DAS Control

4.4   Demodulation

Demodulation will have the following functions:
a. Interfacing with the DAS Control
b. Receiving and acknowledging configuration commands from the DAS Control
c. Receiving formed beams
d. Processing customer signals
e. Interfacing with the DAS data archiving and routing elements through the baseband interfacing function
f. Providing status to the DAS Control function

4.5   Data Processing

Data Archiving, Routing and Retrieval will have the following characteristics:
a. Interfacing with the DAS Control
b. Interfacing with the demodulating element
c. Routing customer data to designated destinations
d. Routing customer data to a local interface
e. Archiving data in accordance with customer requests.
f. Distribute data from archive accordance with customer requests
g. Mimicking WDISC formatting
h. Compatible with IP data transport
i. Providing status to the DAS Control

4.6   Resource Allocation Accounting

Resource Allocation Accounting will maintain the following information for distribution to the customer and/or the WSC as necessary for determining reimbursement and proficiency of operations

a. Resources allocated
b. Resources utilized
c. Verification customer data was transmitted
d. Data quality

Section 5.   Operational Scenario

5.1   Planning

5.1.1 Pre-Mission Planning

Potential customers will go through a loading and RF compatibility analysis prior to approval for using DAS. Two classes of customers (dedicated and non-dedicated) will be supported.

- Dedicated Customers – Customers guaranteed requested support from the shared set of DAS resources, and
- Non-Dedicated Customers – Customers receiving first come, first serve support from the remaining set of shared resources after allocations have been made to support Dedicated Customers. Non-dedicated customers recognize that there will always be a possibility of having service preempted by a dedicated customer requiring the same resources.   However, this concept implies that NASA allocates sufficient non-dedicated resources to meet a pre-defined probability of obtaining service.

A Spacecraft Identification Code (SIC) based processing list will be used for establishing and/or restoring services in the event of equipment failures or resource conflicts.

Orbiting DAS customers are required to provide spacecraft mass, cross-sectional area, and drag coefficient values. These spacecraft specific values are needed for accurate orbit modeling which allows DAS to determine visibility and service schedules up to five days into the future.   In the event these values are not provided, baseline values will be substituted which will impact orbit modeling accuracy, especially for spacecraft with orbits less than 750 km in altitude. DAS Customers with orbit altitudes below 750 km should update the mass value whenever it varies more than 10% from the previously submitted value in order to maintain accuracy of their DAS 5-day orbit predictions.

If the loading analysis determines that the availability of shared resources cannot support additional customers, the Mission Services Project will determine if additional resources must be procured. A Project Service Level Agreement will be negotiated.. If additional resources, including NISN IONet bandwidth, cannot be obtained, planners will ensure a Non-Dedicated Customer understands and acknowledges that they may not receive data in a timely manner and/or that an ongoing service may be interrupted without prior notification.   Real-Time data not transmitted immediately to the customer will be archived for a short period by DAS for a later scheduled playback. These activities are shown in Table 5-1 and should take place a minimum of 18 months prior to commencement of services.

Table 5-1 Planning Sequence

1½ to 2 Years Prior to Operations	1 to 1½ Years Prior to Operations	Customer Operations Begin

• Identification of DAS as Service Provider
   • RF Compatibility Analysis
   • Loading Analyses
• Identification of Additional DAS equipment (if needed)
• PSLA Agreement generation
	• Procure Additional Equipment (if needed)	• Dedicated Customers
		   • DAS configured for support
		
		• Non-Dedicated Customers
		   • Available resources configured for support

5.1.1 Service Request Planning

Each DAS MAR customer resource allocation request will be preceded by an interaction with the DAS that provides the customer with the information needed to decide how to setup a request within the context of the available DAS MAR resource times and the resource utilization objectives. This customer interaction will provide DAS Control with the time window(s) in which DAS resources are requested by the customer. DAS Control will then provide the customer with the time service is available within

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that time window and the TDRS(s) available for the support. The customer can then vary parameters of their request derived from this information. DAS Control only processes requests up to five days in the future. Any service requests beyond this window are stored in DAS until they enter the five day planning period.

DAS Control will resolve any resource conflicts based on a Spacecraft Identification Code (SIC)-based processing list. During periods of heavy resource utilization, it may be necessary to perform more than one iteration of the planning sequence for non-dedicated customers. Non-dedicated customer requests are fulfilled using resources remaining after allocation to dedicated customers. If a dedicated customer preempts a previously scheduled, non-dedicated customer the non-dedicated customer will receive an alert and the DAS Control system will attempt to reschedule the preempted event at another time within the requested window.

5.2   Service Request

The customer will send a request via SWSI for the resources desired, including customer identification and location (ephemeris), identification of the TDRS(s) requested, parameters of resources requested, period of the request, demodulator parameters, archive and retrieval requests, and data forwarding requirements. The DAS Control will interact with the customer via SWSI to establish and confirm a customer request.

Upon receipt of a specific request for resources DAS Control will examine the parameters required to set up the request and determine if they are feasible. If the DAS Control determines that the request is not within the capability of the system at all, the DAS Control will notify the customer to this effect. In the case when only a portion of the service request may be granted, DAS Control will schedule this service and keep the balance of the request queued in case resources become available. The customer will be notified of any pending service from DAS Control.

5.3   Resource Allocation

Upon determining that the request is feasible DAS Control will allocate and reserve appropriate resources. The DAS Control will ensure that subsequent requests for allocations at the same time, using the same SGLT will not be assigned the same resources. If there are no resources available for allocation during the time frame requested, DAS Control will notify the customer.

DAS Control will notify the customer via SWSI if updated ephemeris data for the service is needed.

5.4   Service Implementation

DAS Control will command archive and routing equipment for telemetry data capture before the service begins. DAS beamforming and demodulating elements will be commanded before the signal acquisition sequence is to commence. During the service the customer will be allowed to modify the parameters of the service.

Return data will be routed and archived in accordance with the customer request. During the service the DAS Control will monitor the status of the EMC, beamformer,

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demodulator, and data archiving and routing elements. Regular status will be reported to the customer while the service is ongoing.

5.5   Service Termination

Data that has been archived will be made available for retrieval upon request by the customer. The beamforming, demodulating, buffering and data routing elements will then be made available for other requests.

5.6   Data Retrieval

Data that has been archived will be retained for a specified period. The customer will request the DAS Control to retrieve and route this data to the customer for use. This request will include the identification of the data to be retrieved, the parameters for routing, and the time retrieval and routing is to occur.

5.7   Service Monitoring and Accounting

5.7.1   Service Monitoring

The DAS Control will alert operations personnel whenever anomalies or failures occur that may either require maintenance actions or effect the quality of services provided. In addition, periodic recording of service parameters will be made. This information will be made available for use in verifying service provision.

5.7.2   Service Accounting

The DAS Control will record and retain for retrieval by operations personnel, data that will reflect the services scheduled and the start and stop times of services actually provided. This information will be made available to O&M personnel for use in verifying service provision to NASA.

Section 6.   Customer Identification

6.1   Customers

As defined previously, DAS supports two types of customers. These two types, dedicated and non-dedicated, govern how DAS resources are reserved and used. Dedicated customers have pre-reserved links and are guaranteed support. Non-dedicated customers can use equipment when it is not in use by dedicated customers. Within these two customer types many different support scenarios are possible.

A customer that needs continuous 24x7 global coverage would be defined within DAS as a dedicated customer. The customer may wish to use DAS as a communications link to notify controllers of a spacecraft emergency (an "SOS"), or to notify ground systems in real-time that some sort of event occurred (for example, the presence and direction of a gamma ray burst). Customers that do not have apriori knowledge of their spacecraft attitude (i.e. antenna position), and require 24x7 coverage from the TDRS system must request three simultaneous (one per TDRS) 24x7 services.

DAS can also be used to support multiple spacecraft flying in a single formation. DAS would form a beam on the entire group of spacecraft and multiple DAS receivers would be configured to relay the data from each emitter independently and simultaneously. Additionally, for multiple emitters that are not in a single formation, DAS could be used to poll emitters in a time-sequenced fashion. These types of customers could be supported within DAS as dedicated or non-dedicated customers.

For other customers, some may wish to start a service at a specific time or 'upon demand' (ASAP). DAS can accommodate these types of customers as either dedicated or non-dedicated customers.

Figure 6-1 describes various types of customer scenarios that will be provided by the DAS. Figure 6-2 details a typical continuous, 24x7 global coverage customer with TDRS visibility and requested 24 hour service times. DAS service is continuous over the three simultaneous service requests.

Customer type scenarios apply to both dedicated/nondedicated customers and are as follows:

a. Continuous – This customer will require a continuous real-time downlink.
b. Periodic - The customer routinely downloads data once per stated period.
c. Intermittent/On demand – The customer will download data once only.
d. Polling – A group of emitters are monitored in rotation. This can be used to notify the customer that communications should be established with the emitter, to download routine status information and/or periodic science data.

e. Formation Flying – A group of emitters are closely spaced in the same orbit and usually in the same MA beam. Several demodulators can receive the output of a single beamformer.

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Figure 6-1 DAS CUSTOMER SERVICE SCENARIO

CUSTOMER TYPE	HOUR	0	3	6	9	12	15	18	21	24
CONTINUOUS (Stationary Single Emitter [balloon/aircraft], TDE)		oooo●oooo	oooo●oooo	oooo●oooo	oooo●oooo	oooo●oooo	oooo●oooo	oooo●oooo	oooo●oooo	
CONTINUOUS (Stationary Single Emitter [balloon/aircraft], TDW)		◊◊◊◊♦◊◊◊◊	◊◊◊◊♦◊◊◊◊	◊◊◊◊♦◊◊◊◊	◊◊◊◊♦◊◊◊◊	◊◊◊◊♦◊◊◊◊	◊◊◊◊♦◊◊◊◊	◊◊◊◊♦◊◊◊◊	◊◊◊◊♦◊◊◊◊	
CONTINUOUS (Stationary Multiple Emitters [balloons/aircraft], TDW)		◊◊◊◊◊◊◊◊	◊◊◊◊◊◊◊◊	◊◊◊◊◊◊◊◊	◊◊◊◊◊◊◊◊	◊◊◊◊◊◊◊◊	◊◊◊◊◊◊◊◊	◊◊◊◊◊◊◊◊	◊◊◊◊◊◊◊◊	
CONTINUOUS (Single Emitter, 90-min. orbit, TDE/TDZ/TDW) (See Table 6-2)		oox◊◊ox◊◊	oox◊◊ox◊◊	oox◊◊ox◊◊	oox◊◊ox◊◊	oox◊◊ox◊◊	oox◊◊ox◊◊	oox◊◊ox◊◊	oox◊◊ox◊◊	
FORMATION FLYING 1 (Multiple Emitters, 90-min. orbit, 20-min. coverage/orbit, TDE)		o　　o	o　　o	o　　o	o　　o	o　　o	o　　o	o　　o	o　　o	
FORMATION FLYING 2 (Multiple Emitters, 90-min. orbit, 20-min. coverage/hour, TDE/TDZ/TDW)		o　x　♦	o　+　◊	●　x　◊	o　x　♦	o　+　◊	●　x　◊	o　+　♦	●　x　◊	
INTERMITTENT/ON DEMAND (Single Emitter, 90-min. orbit, 1-hour coverage, TDE/TDZ)						oox				
PERIODIC (Stationary Multiple Emitters [balloons/aircraft], TDE)		oo　　ooo	oo　　ooo	oo　　ooo	oo　　ooo	oo　　ooo	oo　　ooo	oo　　ooo	oo　　ooo	
PERIODIC (Single Emitter, 90-min. orbit, TDW/TDE every other orbit)		◊o	◊o	◊o	◊o	◊o	◊o	◊o	◊o	
POLLING/FORMATION (Multiple Emitters in same orbit, TDE/TDZ/TDW)		●●+●●+●♦	●●+●●+●♦	●●+●●+●♦	●●+●●+●♦	●●+●●+●♦	●●+●●+●♦	●●+●●+●♦	●●+●●+●♦	
POLLING (Multiple Emitters in different orbits, TDE/TDZ/TDW)		●● ●● ●●　+++ + +　♦♦　♦♦♦	●●● ●●●　++ +++　♦♦♦♦♦ ♦♦	●●● ●●　+++ + +　♦♦ ♦♦♦	●●● ●●●　++ +++　♦♦♦ ♦♦	●● ●● ●●　+++ + +　♦♦ ♦♦	●●● ●●●　++ +++　♦♦♦♦ ♦♦	●●● ●●●　++ +++　♦♦♦♦ ♦♦	● ●●● ●●　+++ + +　♦♦ ♦♦♦	

Each symbol is a 20-minute time increment.

o = TDRS-East (TDE) ● = Reconfiguration during TDE service
x = TDRS-ZOE (TDZ) + = Reconfiguration during TDZ service
◊ = TDRS-West (TDW) ♦ = Reconfiguration during TDW service

Figure 6-2 CONTINUOUS DAS CUSTOMER SERVICE SCENARIO DETAIL

TDRS VISIBILITY HOUR	0	3	6	9	12	15	18	21	24
TDRS-East	oo oo	oo oo	oo oo	oo oo	oo oo	oo oo	oo oo	oo oo	
TDRS-ZOE	xx xx	xx xx	xx xx	xx xx	xx xx	xx xx	xx xx	xx xx	
TDRS-West	◇◇ ◇◇	◇◇ ◇◇	◇◇ ◇◇	◇◇ ◇◇	◇◇ ◇◇	◇◇ ◇◇	◇◇ ◇◇	◇◇ ◇◇	

Each symbol is a 20-minute time increment.

☐ = TDRS-East (TDE) service request   o = TDRS-East visibility
☐ = TDRS-ZOE (TDZ) service request   x = TDRS-ZOE visibility
☐ = TDRS-West (TDW) service request   ◇ = TDRS-West visibility

Section 7. Operations and Maintenance Resources

7.1 Operations Resources

DAS requires operations personnel from WSGT/STGT, GRGT and customers to effect services. During normal operations the DAS operation will be automated to the maximum extent possible to minimize involvement of dedicated operations personnel. DAS will provide alerts to operations personnel when operational abnormalities are detected in DAS resources. Operations personnel will be provided the means to monitor, coordinate, control and report DAS operations. Under unique circumstances, e.g., loss of communications with DAS by the customer WSC operations personnel will be allowed to request services for any customer at any time.

7.2 Maintenance Concept

The maintenance concept for the DAS will achieve the system/equipment operational availability requirements, while minimizing the number of personnel and unique test equipment. The maintenance approach will maximize the use of existing maintenance capabilities/facilities both at the WSC Hardware Maintenance Depot (HMD) and at GRGT. Maintenance capabilities will be established at the Organizational and Depot levels.

The DAS maintenance concept will call for the removal and replacement of failed Line Replaceable Units (LRUs) with return of the unrepairable units to the vendor for repair. Failed LRUs at the GRGT will be shipped to the WSC. GRGT personnel may attempt to effect simple repair action, with site management approval, provided the repair causes no impact on locally required resources and clearly proves to be the cost-effective method to rectify the failure. WSC will send replacements to the GRGT upon notification that a failed unit is being turned in for repair.

7.3 Levels of Maintenance

7.3.1 Organizational Level

Organizational level maintenance includes Preventive (Scheduled) and Corrective (Unscheduled) maintenance. Organizational level maintenance will be restricted to those maintenance actions that are performed at the system/equipment location on a remove and replace basis. The DAS control will allow O&M personnel to remove a resource to conduct maintenance.

7.3.2 Depot Level

Depot level maintenance is limited to corrective maintenance and includes fault isolation within the chassis/board/module to the piece/part, replacement of the piece/part, and retest/calibration of the chassis/ board/module. Depot level maintenance requires designated facilities, comprehensive support and test equipment and personnel with specialized training and experience.

7.4　Types of Maintenance

7.4.1　Preventive Maintenance

Preventive maintenance includes scheduled maintenance activities, which are performed to retain the system in an operational condition. Preventive maintenance procedures and schedules will be established as an integral component of the equipment technical data and documentation.

7.4.2　Corrective Maintenance

Corrective maintenance includes all unscheduled maintenance actions performed as a result of a fault/failure, which renders the equipment either partially or completely inoperable. The objective of corrective maintenance is to restore the equipment to an operational condition within the specified operational availability requirements.

7.4.3　Warranty Maintenance

If a failed LRU is determined to be covered under a warranty program, the LRU will be sent to the vendor for repair and return to the WSC, GRGT, or the LSD.

Section 8. Security

8.1 Security

The DAS will conform to the requirements and procedures of NASA NPG 2810.1, Security of Information Technology for Mission Information.

The DAS will be installed within the WSC and will conform to the requirements and procedures contained in 530-WSC-0024, Information Technology Systems Security Plan (ITSSP) for the WSC and 530-WSC-0009, WSC Security Manual.

The DAS will interconnect with customers via the Closed IOnet to the SWSI for control and status. The DAS will conform to the requirements and procedures contained in 452-SP-SWSI, Security Plan for SWSI.

The DAS will connect with the Closed IOnet or dedicated customer circuits for telemetry delivery. The DAS will conform to the requirements and procedures contained in 290-003, IP Operational Network (IOnet) Security Plan and 290-004, IP Operational Network (IOnet) Access Protection Policy and Requirements Document (Includes Certification Requirements Checklist).

Abbreviations and Acronyms

COTS	Contractor Off the Shelf
DAS	Demand Access System
EMC	Element Multiplexer Correlator
F1-F7	TDRS F1-F7
GRGT	Guam Remote Ground Terminal
HMD	Hardware Maintenance Depot
IP	Internet Protocol
IOnet	Internet Protocol (IP) Operational Network
LRU	Line Replaceable Unit
LSD	Logistics Support Depot
MAR	Multiple Access Return
NISN	NASA Integrated Services Network
PCD	Project Commitment Document
PSLA	Project Service Level Agreement
RF	Radio Frequency
SGLT	Space to Ground Link Terminal
SN	Space Network
STDN	Spaceflight Tracking and Data Network
STGT	Second TDRS Ground Terminal
SWSI	Space Network (SN) Web Services Interface
TCP/IP	Transmission Control Protocol/Internet Protocol
TDRS	Tracking and Data Relay Satellite
TGBFS	Third Generation Beamforming Subsystem
TDRSS	Tracking Data Relay Satellite System
WDISC	WSC TCP/IP Data Interface Service Capability
WSC	White Sands Complex (consists of STGT, WSGT and GRGT)
WSGT	White Sands Ground Terminal